Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A maximum likelihood decoder comprising:

a path selection means for ~~providing relatively high likelihood of~~ obtaining at least two paths of getting to ~~each~~ a decoding state from at least three paths, and for selecting a maximum likelihood path from said at least two paths,

wherein a log likelihood of getting to a state in the decoder is determined by ~~a soft-input~~ an input value from an encoder encoded with a trellis so as to provide at least three paths for getting to the decoding state, said input value received through a communication channel having noise such that said input value is regarded as being a soft value.

2. (Previously Presented) The decoder according to claim 1, wherein said path selection means includes a comparison means for comparing log likelihoods of all combinations of said at least two paths selected from said at least three paths for getting to each state.

3. (Previously Presented) The decoder according to claim 2, further comprising:

an absolute value selection means for selecting an absolute value of the difference between data corresponding to the maximum likelihood path and data corresponding a second maximum likelihood path.

4. (Previously Presented) The decoder according to claim 3, wherein said absolute value selection means includes an absolute value computing means for computing absolute values of

the difference of all combinations of said at least two paths selected from said at least three paths,

wherein the computed absolute values are compared for magnitude according to outcome of said comparison means.

5. (Previously Presented) The decoder according to claim 3, further comprising:

a linear approximation means for computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable, said linear approximation means using said variable as an absolute value of the difference between data corresponding to said maximum likelihood path and fed from said absolute value selection means and data corresponding to said second maximum likelihood path.

6. (Previously Presented) The decoder according to claim 5, wherein said linear approximation means computes said correction term by expressing a coefficient representing the gradient of said one-dimensional function for multiplying said variable at least by means of a power exponent of 2.

7. (Original) The decoder according to claim 6, wherein said linear approximation means discards lower bits of an input data according to the power exponent expressing the coefficient representing the gradient of said function.

8. (Previously Presented) The decoder according to claim 6, wherein said linear approximation means discards bits from the lowest bit to the k-th lowest bit of the input data when the coefficient representing the gradient of said function is expressed by -2^{-k}.

9. (Previously Presented) The decoder according to claim 6, wherein said linear approximation means computes said correction term by expressing the coefficient representing an intercept of said function by means of a power exponent of 2.

10. (Original) The decoder according to claim 9, wherein said linear approximation means computes said correction term by expressing the coefficient representing the intercept of said function by means $2^m - 1$.

11. (Previously Presented) The decoder according to claim 10, wherein said linear approximation means discards bits from the lowest bit to the k-th lowest bit of the n-bit input data and inverts m bits from the k+1-th lowest bit to the m+k-th lowest bit when the coefficient representing the gradient of said function is expressed by means of -2^{-k}.

12. (Original) The decoder according to claim 6, wherein said correction term shows a positive value.

13. (Original) The decoder according to claim 12, wherein said linear approximation means makes the correction term equal to 0 when a negative value is produced by computing said correction term.

14. (Previously Presented) The decoder according to claim 1, wherein said log likelihood is a log expression of a probability of getting to a state, using the natural logarithm.

15. (Previously Presented) The decoder according to claim 1, further comprising:

a first probability computing means for computing for each soft-input value a first log likelihood logarithmically expressing a first probability determined by a code output pattern and said soft-input value;

a second probability computing means for computing for each soft-input value a second log likelihood logarithmically expressing a second probability of getting to each state from a coding starting state in a time series; and

a third probability computing means for computing for each soft-input value a third log likelihood logarithmically expressing a third probability of getting to each state from a coding terminating state in an inverted time series,

wherein said second probability computing means and said third probability computing means includes path selection means.

16. (Previously Presented) The decoder according to claim 15, further comprising:

a soft-output determining means for determining a log soft-output logarithmically expressing a soft-output in each time slot, using said first log likelihood, said second log likelihood, and said third log likelihood.

17. (Previously Presented) The decoder according to claim 16, wherein said log soft-output is a natural logarithmic expression of said soft-output.

18. (Previously Presented) The decoder according to claim 15, wherein said second probability computing means and said third probability computing means include absolute value selection means for determining absolute values of the difference between data corresponding to the maximum likelihood path and data corresponding to the second maximum likelihood path showing a second highest likelihood.

19. (Previously Presented) The decoder according to claim 15, wherein said second probability computing means and said third probability computing means include linear approximation means for computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable.

20. (Previously Presented) The decoder according to claim 1, wherein said log likelihood is determined by computations replacing multiplications with logarithmic additions and replacing additions with logarithmic maximum value computations.

21. (Previously Presented) The decoder according to claim 20, wherein a maximum a posteriori probability decoding operation is based on Max-Log-BCJR.

22. (Previously Presented) The decoder according to claim 5, wherein said log likelihood is determined by computations replacing multiplications with logarithmic additions and replacing

additions with logarithmic maximum value computations and computations of said one-dimensional function.

23. (Previously Presented) The decoder according to claim 22, wherein a maximum a posteriori probability decoding operation is based on Log-BCJR.

24. (Previously Presented) The decoder according to claim 1, wherein said path selection means is used to decode convolutional codes.

25. (Currently Amended) A decoding method for a maximum likelihood decoder, the method comprising:

~~providing relatively high likelihood of~~ obtaining at least two paths of getting to ~~each~~ a decoding state from at least three paths, and selecting a maximum likelihood path from said at least two paths,

wherein a log likelihood of getting to a state in the decoder is determined by ~~a soft-input~~ an input value encoded with a trellis so as to provide at least three paths for getting to the decoding state, said input value received through a communication channel having noise such that said input value is regarded as being a soft value.

26. (Previously Presented) The decoding method according to claim 25, wherein said providiing includes comparing likelihoods of all combinations of said at least two paths selected from said at least three paths.

27. (Previously Presented) The decoding method according to claim 26, further comprising:

selecting an absolute value of the difference between data corresponding to the maximum likelihood path and data corresponding a second maximum likelihood path.

28. (Previously Presented) The decoding method according to claim 27, wherein said selecting includes computing absolute values of the difference of all the combinations of said at least two paths selected from said at least three paths,

wherein the computed absolute values are compared for magnitude according to outcome of said comparing likelihoods.

29. (Previously Presented) The decoding method according to claim 27, further comprising:

computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable, said linear approximation step using said variable as an absolute value of the difference between data corresponding to said maximum likelihood path and fed in said absolute value selection step and data corresponding to said second maximum likelihood path.

30. (Previously Presented) The decoding method according to claim 29, wherein said computing by linear approximation includes computing said correction term by expressing a coefficient representing the gradient of said function for multiplying said variable at least by means of a power exponent of 2.

31. (Previously Presented) The decoding method according to claim 30, wherein said computing by linear approximation includes discarding lower bits of an input data according to the power exponent expressing the coefficient representing the gradient of said function.

32. (Previously Presented) The decoding method according to claim 30, wherein said computing by linear approximation includes discarding bits from the lowest bit to the k-th lowest bit of the input data when the coefficient representing the gradient of said function is expressed by -2^{-k}.

33. (Previously Presented) The decoding method according to claim 30, wherein said computing by linear approximation includes compute said correction term by expressing the coefficient representing the intercept of said function by means of a power exponent of 2.

34. (currently amended) The decoding method according to claim 33, wherein said computing by linear approximation includes computing said correction term by expressing the coefficient representing the intercept of said function by means of $2^m - 1$.

35. (Previously Presented) The decoding method according to claim 34, wherein said computing by linear approximation includes discarding bits from the lowest bit to the k-th lowest bit of the n-bit input data and to invert the m bits from the k+1-th lowest bit to the m+k-th lowest bit when the coefficient representing the gradient of said function is expressed by means of -2^{-k}.

36. (Original) The decoding method according to claim 30, wherein said correction term shows a positive value.

37. (Previously Presented) The decoding method according to claim 36, wherein said computing by linear approximation includes making the correction term equal to 0 when a negative value is produced by computing said correction term.

38. (Previously Presented) The decoding method according to claim 25, wherein said log likelihood is a natural log expression of a probability of getting to a state.

39. (Previously Presented) The decoding method according to claim 25, further comprising:

a first probability computing step for computing for each soft-input value a first log likelihood logarithmically expressing a first probability determined by a code output pattern and said soft-input value;

a second probability computing step for computing for each soft-input value a second log likelihood logarithmically expressing a second probability of getting to each state from a coding starting state in a time series; and

a third probability computing step for computing for each soft-input value a third log likelihood logarithmically expressing a third probability of getting to each state from a coding terminating state in an inverted time series,

wherein said second probability computing step and said third probability computing step includes path selection steps.

40. (Previously Presented) The decoding method according to claim 39, further comprising:

a soft-output determining step for determining a log soft-output logarithmically expressing a soft-output in each time slot, using said first log likelihood, said second log likelihood and said third log likelihood.

41. (Previously Presented) The decoding method according to claim 40, wherein said log soft-output is a natural logarithmic expression of said soft-output.

42. (Previously Presented) The decoding method according to claim 39, wherein said second probability computing step and said third probability computing step include absolute value selection steps for determining absolute values of the difference between data corresponding to the maximum likelihood path and data corresponding to the second maximum likelihood path showing a second highest likelihood.

43. (Previously Presented) The decoding method according to claim 39, wherein said second probability computing step and said third probability computing step include linear approximation steps for computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable.

44. (Previously Presented) The decoding method according to claim 25, wherein said log likelihood is determined by computations replacing multiplications with logarithmic additions and replacing additions with logarithmic maximum value computations.

45. (Previously Presented) The decoding method according to claim 44, wherein a maximum a posteriori probability decoding operation is based on Max-Log-BCJR.

46. (Previously Presented) The decoding method according to claim 29, wherein said log likelihood is determined by computations replacing multiplications with logarithmic additions and replacing additions with logarithmic maximum value computations and computations of said one-dimensional function.

47. (Previously Presented) The decoding method according to claim 46, wherein a maximum a posteriori probability decoding operation is based on Log-BCJR.

48. (Previously Presented) The decoding method according to claim 25, wherein said obtaining at least two paths includes decoding convolutional codes.

Amendments to the Drawings:

The attached sheet of drawings includes changes to FIG. 8. This sheet replaces the original sheet including FIG. 8. In Figure 8, a legend --(Prior Art)-- has been added.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes